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British educational trajectories: school and degree performance and the potential implications of changing the post-16 school examination system

British university admissions officers have used applicants' results at two sets of public examinations (normally taken at age 16 and 17 respectively) to assess their suitability as candidates for degree courses. In 2013 the UK government abolished the second set, arguing – with data – that this would not hamper the admissions procedure. Using the same data, analyses employing a novel procedure falsify the government's arguments: many well-qualified students for courses in the country's leading universities may not be offered places there in the absence of data on their academic progress during their two years of post-secondary education.

key words university admissions * school examination performance * university degree performance * contingency tables

Introduction

Much has been written in Great Britain – as elsewhere – about students' trajectories in the transition from school to university and the relationship between examination performances at both types of institution (see, for example, Smith and Naylor, 2005; Gibbons and Vignoles, 2012; Boliver, 2013; Mangan et al., 2013; Manley and Johnston, 2014). In the UK students compete to gain admission to what are generally regarded as the country's more prestigious universities – which in turn compete to get the 'best students'. Universities take a range of factors into account when deciding whether to offer an applicant a place on a particular degree course, but most important – and usually eventually determining whether the student takes up an offered place – is performance at the examinations linked to the government's national curriculum that are taken towards the end of the period of school education. Because of the timing of those examinations, however, the offers of places have to be made in the great majority of cases on the basis of expected performance in the final examination in a sequence of three (GCSE, AS-level, A2) – with university admissions officers using performance at the first two sets of examinations as major indicators of that expected performance. (GCSE exams are taken two years and AS-level one year prior to the final set in the great majority of cases.) Most students get offers of admission conditional on their achieving a prescribed set of grades at A-level, which combines their performance at the AS and A2 examinations.

In 2013, as part of a series of reforms of the schools examination system aimed at increasing standards of performance, the UK government decided to change that sequence of three examinations – a decision that applied only to students attending schools in England and Wales but with implications for university admissions throughout the UK. It removed the middle set of examinations, arguing that this would not have a significant impact on the university admissions process, an argument contested by many of those involved. In this paper, we use a recently-developed modelling process for the analysis of large contingency tables to evaluate that argument. Because the decision to change the examination system was taken before publication of the government's own research sustaining the argument that it would not impact negatively on the university admissions' procedure, this enables a discussion of the role of research in policy

development. This provides a contrast between 'evidence-based policy' and the, less desirable, practice of seeking 'policy-based evidence' after the policy has been determined.

From school to university

The English state school system has a series of government-prescribed tests of students' ability, linked to a national curriculum, which almost all publicly-funded schools have to apply. The examinations administered at the end of the period of compulsory education (at age 16) lead to the award of the General Certificate of Secondary Education (GCSE) which candidates sit in any number of subjects, with a separate grade (A-E) being awarded for each paper sat. Most students intending to proceed to higher education sit examinations in at least eight separate subjects: their overall performance is evaluated by allocating a point score to each grade from which an average is derived – although other performance measures are applied in particular circumstances (in many schools, for example, only those with at least five passes at grades A-C are allowed to enter courses for the next two sets of examinations).

In the post-compulsory school years (for which many students attend sixth-form or further education colleges rather than secondary/high schools) those preparing for university entrance take courses leading to A-level (i.e. advanced) qualifications. Until 2015, these were taken in two stages. At the end of the first year students were examined – most of them in four separate subjects – at what was termed AS-level (Advanced Secondary), with grades (A-E indicating a pass) awarded for each. They then proceeded at the end of the next year to take A2 examinations, usually in three subjects though a substantial number of the more able took them in four. The grades for these were then combined with their AS-level grades to determine their overall A-level grade in each subject taken at A2 level.

Admission to universities is determined very largely by those A-level grades, but for most students they are not known before the applications occurs and the universities decide which students they will offer places to. Applications are made to universities through a central clearing house, with students applying for places on up to five degree courses (the number has changed over time), in the first term of their final school year (i.e. in the September-December preceding the year in which they intend starting their degree course). Universities then decide (normally by the end of the following March) which applicants to offer places in the following year, setting the A-level grades necessary in order for the students to take up the offer. Students must decide in May which offer they will accept (which contractually binds them if they get the assigned grades) – and can hold another offer in reserve if they fail to get the required grades for their first-choice institution. A2-level examinations are not sat until that May-June, with the A-level grades made available in August, when students know whether they have achieved the level needed for acceptance on their preferred course and universities know how many students have made their grades.[1]

In the absence of the A-level grades, universities have to decide whether to make offers to applicants based on whatever data are available to them, which have included GCSE and AS-level performance, alongside other, more subjective information including reports from teachers which include their assessments of students' likely performance at A-level (most based in considerable part on their AS-level performance). In 2013, however, the UK coalition government – arguing that standards at A-level were declining because of the change three decades earlier to a modular structure including the introduction of AS-levels – proposed to eliminate AS-levels as an intermediate stage in the A-level qualification and return to the previous structure of two-year courses with the grading based on course-end examinations only.[2] (The rationale for the government's decision can be found in Department for Education, 2013a, 2013b, and Laws, 2013.) The relevant government ministers later argued – on the basis of a flawed piece of statistical analysis

(Department for Education, 2013c; for a commentary see Johnston et al., 2015) – that as it was possible to predict degree-level performance as well from GCSE as from AS-level grades the lack of the latter would not in any way impede the university admissions procedure.[3]

This argument assumed that there is a strong correlation between the two sets of examination performance taken only a year apart, so that the absence of one of them in any assessment of potential to undertake a university degree course would not be compromised. In the data set used by the government ministers' statisticians to provide evidence backing the decision to abolish AS-levels in the form that could be used for university admission decisions, however, the correlation between the two sets of grades in an analysis of over 88,000 students was only 0.62 (i.e. an r^2 value indicating that only 38 per cent of the variation in AS-level performance could be accounted for by GCSE performance). The reasons for this are undoubtedly several: some students are 'late developers' whereas others 'peak early', for example; some students make the wrong choice of subjects to study at AS-level and perform badly, whereas focusing on those they are particularly good at, and enjoy, means that others perform better in the second set of exams than in the wider spectrum of subjects studied at GCSE; and some students fail to perform up to expectations for a variety of reasons – health, application to study, etc. But what that finding implies – and what many involved in the university admissions process argued when the policy was announced and imposed – is that the AS-level examinations provide important and timely information without which the evaluation of whether applicants have the potential to benefit from and perform well in a particular degree course could be substantially impeded.

Is that the case: has information on both GCSE and AS-level performance – rather than just the former – been valuable in suggesting whether a student will perform well at university? As noted above, British universities are commonly arranged along a continuum in terms of their perceived academic status: most of those towards its more desirable pole – often termed the country's 'elite universities' – get more applicants per place than those with a lower status.[4] The former are usually over-subscribed for the great majority of their courses, so have to decide which students to offer places to, in part at least by using the quantitative data available in their GCSE and AS-level performances to identify the better-qualified applicants for their prestigious degree programmes.

There should, therefore, be clear evidence that AS-level results assist universities to identify the students best qualified – at the time of application – to study on their degree programmes; the 'better' students should be over-represented at the 'better' universities.[5] To test whether that has been the case, we use the same data set employed by the UK government's statisticians to sustain the case for abolishing AS-levels, which includes information on performance in those exams and in the final degree classification. (The data were made available to us following a Freedom of Information request: the original research was reported in Department of Education, 2013b.) This data set has a number of drawbacks (outlined in Johnston et al., 2015) but it is the best currently available and by using it we are able to draw direct comparisons with the government's conclusions. In analysing those data, rather than deploy the commonly-used statistical procedures based in the general linear model we have applied a recently-developed procedure for identifying the main, statistically-significant, patterns in large contingency tables.

Modelling tables of counts

Most statistical analyses of large and complex data sets containing, in part at least, categorical variables use techniques such as multinomial logistic regression analysis. In their basic forms, these identify differences in the ratios of the marginal totals in the contingency tables that are created using the categorical variables. To obtain greater detail regarding differences between the internal cells of such matrices requires the inclusion of interaction terms, but these are not always tractable

– in part because even with large datasets there are some cells within the multivariate contingency table with only small numbers of observations. They are also difficult to interpret, especially the *n*-way interactions when *n* is greater than 2. Preacher et al. (2006, 437) argue that 'conducting these tests and plotting the conditional relations is often a tedious and error-prone task', yet, as Elwert and Winship (2010), among others, stress, incorporating interaction terms is crucial in exploring the heterogeneity that characterises most social science data sets.

The modelling procedure deployed here is designed to tackle this issue directly by focusing on all of the cells in a multi-dimensional contingency table in a fully-saturated model that has the additional advantage, because of its foundation in Bayesian statistics, of treating the small numbers in some of a table's cells by, in Tukey's (1986) memorable phrase, 'borrowing strength' from elsewhere in the data. The procedure takes the table of counts – the observed values in each cell – and calculates an associated expected value on the assumption of a null model with no significant variations in the distribution of observations across the cells. The observed:expected ratio for each cell is then calculated, and variations in their logged values modelled to give estimated ratios with their Bayesian credible intervals (CIs). The exponents of these estimated 'shrunk' ratios take the value of 1.0 if the observed and expected values do not differ. Values exceeding 1.0 indicate more observations in the cell than expected, and values less than 1.0 indicate less; the associated CIs allow an evaluation of both whether any estimated ratio is significantly different from 1.0 (indicating either relative concentration of observations in, or absence from, that cell) and whether any one estimated cell value is significantly larger or smaller than another. (For a full description and example of the procedure, see Jones et al., 2015.)

We have applied this procedure to multi-dimensional contingency tables containing data on each student's GCSE performance, AS-level performance, type of higher education institution attended, and degree result. For the first two, students have been divided into quintiles according to the standard point-systems deployed in assessing performance: mean score for GCSE and total score for AS-level. Degree outcome is placed in the standard four classes used by all UK universities (1st, 2.1, 2.2 and 3rd), with the very small numbers obtaining pass degrees excluded. Finally, the degree-awarding institutions are placed in five groups according to their generally-accepted position within the country's status hierarchy for universities:

- The Russell Group universities, generally accepted as the most prestigious, research-driven institutions with the highest grades required for admission to their degree programmes (these self-selected 24 institutions have formed their own organisation separate from that to which all of the country's universities subscribe – UniversitiesUK);[6]
- All other universities founded prior to 1992, which are also research-intensive institutions and include those 'plateglass universities' created in the 1960s period of rapid university expansion which are not members of the Russell Group;
- Those universities which gained that status in 1992 as a result of the merger of what were formerly two separate higher education sectors; formerly polytechnics, created in the 1960s with a focus on vocational higher education and administered by local governments, they were invited to apply for university status which gave them the right to confer their own degrees without, as previously, external validation – all did;
- Universities created post-1992, most of them being upgraded former teacher training institutions offering degrees; and
- Other, non-university degree-awarding institutions.

The expectation was that universities in the first two categories would attract the better-qualified students, who would accordingly get the better degree results. This is evaluated by tabulating the estimated observed:expected ratios according to students' prior qualifications. Three analyses were conducted: the first explored the type of institution students attended according to their GCSE and

AS-level scores; the second explored their degree performance according to the same two scores; and the third incorporated not only GCSE and AS-level scores but also the type of institution attended in an examination of degree results. All three models had excellent fits as assessed by a chi-squared goodness of fit test between the observed and expected counts: the precision-weighted modelled counts are very close to the observed values, indicating that the models have captured well the underlying patterns in the data.

GCSE performance, AS-level performance, and institution attended

Table 1 shows the estimated ratios for attending each type of institution, according to the candidate's GCSE and AS-level scores, by quintiles. Ratios greater than 1.0 indicate more candidates than expected in that cell if the allocation of students to institutions was indifferent to their performance at GCSE and AS-level (in which case each institutional type would be drawing 4 per cent of its intake from each of the 25 combinations of the AS and GCSE quintiles); those less than 1.0 indicate where there are fewer than expected. The great majority of the 125 ratios are in bold indicating that candidates' performances at the two examinations were crucial determinants of which type of institution they were accepted by. In general, those with the higher scores were more likely to attend a Russell Group university; those with the lower scores were more likely to attend either a Post-1992 university or a non-university degree-awarding institution (i.e. the 'Other' category).

Given that the main focus of this analysis is on the *separate* impact of GCSE *and* AS-level performance, the differences down the columns within each block of five ratios shown in Table 1 are of particular interest. The first block of five rows, for example, refers to students in the lowest quintile for GCSE performance. Among them, the ratio for attending a Russell Group university was only 0.07 if a candidate also fell within the lowest quintile for AS-level performance; the number of students attending one of those universities with such GCSE and AS-level performances was only 7 per cent of what it would have been if the distribution of candidates across the five types of institution was not at all related to their ability as shown in those examinations. Students' GCSE results make a substantial difference to the type of university they attend. Those with the weakest GCSE results were unlikely to obtain a place at a Russell Group institution but as the candidates' AS-level performance increased – although they remained in the lowest quintile for GCSE performance – so the probability that they obtained a place in one of those universities increased. There were still fewer of them than expected if the admissions process took no account of examination performance, but the rates increased from 0.07 through 0.14, 0.27 to 0.54 (i.e. basically doubling for each quintile increase in AS-level performance): those in the highest quintile for AS-level had a ratio exceeding 1.0, but this was not statistically significantly different from that threshold.

A similar sequence regarding obtaining a place at a Russell Group university occurs in each block of five rows in Table 1: whatever the students' performance at GCSE, the better the subsequent outcome of their AS-level examinations, the greater the probability that they obtained a place at one of those prestigious institutions. Exactly the same sequence occurs in the second column, relating to attendance at the other Pre-1992 Universities – except in the last block where the lower ratios for those in the highest quintile for GCSE and the highest two quintiles for AS-level undoubtedly reflect the large number of such students who obtained places at Russell Group universities (presumably in competition with the other Pre-1992 universities for the 'best' candidates). Furthermore, and complementing the findings for the Russell Group and other Pre-1992 universities, within each block the ratios for attending a university in one of the other three categories (the 1992 universities, those created since then, and the 'Other' institutions) decline as AS-level performance increased. Sorting of students into the different types of institution was based on their performance at both examinations, therefore: whatever their performance at GCSE, those with a better outcome at AS-

level a year later were more likely to obtain a place at either one of the country's generally-accepted 'elite universities' (i.e. the Russell Group) or one of the other longer-established institutions.

Although most of the ratios shown in Table 1 are significantly different from 1.0, this does not necessarily mean that any one ratio is also significantly different from another. Whether that is the case can be evaluated by comparing the frequency distributions for any pair of individual ratios as indicated by their Bayesian credible intervals (CIs). The standard procedure for comparing two estimated values uses 2 standard error bands around those ratios; if the range between the estimated values for the lowest (0.025) and highest (0.975) CIs for one ratio does not overlap the range for the other, then they differ significantly and the conclusion can be drawn that one is larger than the other.[7] Thus, for the first column of estimated ratios in the first block in Table 1 – 0.7, 0.14, 0.27, 0.54, and 1.11 – application of this test shows no overlapping distributions between adjacent pairs; among students placed in the lowest quintile for GCSE performance, those with higher AS-level performances were significantly more likely to gain entry to a Russell Group university than those with weaker performances (i.e. in a lower quintile band) at that second set of examinations.

The same pattern of significant differences in obtaining a place at a Russell Group university applies within each of the next three quintiles for GCSE performance, but this is not the case for the final quintile (those performing best at GCSE). None of the higher ratios in the lowest block for that column (1.63, 1.87, 2.11, 2.87 and 3.16) is significantly different from that directly preceding it; those for the fourth and fifth quintiles at AS-level are significantly larger than those for the first and second quintiles, however, sustaining a conclusion that a much better performance at AS-level, whatever the performance at GCSE, the greater the likelihood of a student entering a Russell Group university.

Exactly the same patterning applies to the ratios in the second column of Table 1 as to the first: the better that students performed at both GCSE *and* AS-level the more likely they were to gain admission to a non-Russell Group Pre-1992 university. Complementing this, the reverse pattern is shown in the next two columns: the *lower* the quintile for GCSE performance the greater the probability that a student gained a place at either a 1992 or a Post-1992 university, but within each of those quintiles, the better the AS-level performance the smaller that probability (because, it is assumed, they were able to gain places at either Russell Group or other Pre-1992 universities). Again many of the differences between adjacent ratios in each block are significantly different statistically. Finally, though with fewer significant differences, the same general pattern applied to admissions to the non-University degree-awarding institutions.

Performance at *both* sets of examinations was thus a crucial influence on which type of institution students attended. Taking the five groups as indicative of the general academic standing of British degree-awarding institutions, students who performed best in their GCSE examinations were most likely to be accepted by one of the more prestigious institutions which had university status before 1992, whereas those with a weaker performance then were concentrated – much more than would be expected if the allocation of students to institutions were independent of their GCSE performance – in the less prestigious, more recent creations. However, and of particular relevance given the policy decision to abandon the next set of examinations, whatever their performance at GCSE students who performed better, a year later, in the AS-level examinations were more likely to gain a place at one of the older-established institutions. That second set of examinations was clearly crucial as a determinant of both whether such institutions offered students a conditional place dependent on their later performance in the A2-level examinations leading to the final A-level grade, and whether the students who were made such offers then met those conditions and were able to take up a place there.

GCSE performance, AS-level performance, and degree performance

Table 2 gives the estimated ratios for getting a degree in each of the four main classes, by quintiles of GCSE and AS-level performance – as in Table 1. The general pattern of results is again as expected; those who performed well at GCSE were significantly more likely to get either a class 1 or 2.1 degree than would be the case if degree grades were evenly distributed across the quintiles, and the same was true for performance at AS-level. Complementing that pattern, the weaker the performance at either of those examinations the greater the ratio for obtaining only a 2.2 or a 3rd class degree.

Combining the two, in most cases for any GCSE performance level the better the AS-level performance the greater the likelihood of the student getting a 1st or 2.1. Thus for students in the lowest quintile for GCSE performance (the first block of ratios in Table 2), the better the AS-level performance the larger the ratio for getting a 1st: although all of the ratios are significantly less than 1.0 they increase substantially across the five AS-level quintiles from 0.29 to 0.83. There is some overlap of the CIs for those ratios, but those for the fourth and fifth AS-level quintiles are significantly different from those for the first and second, a pattern that applies to the other GCSE quintiles as well, plus for the other degree classes. A substantially better performance at AS-level than at GCSE results in a greater probability of getting a 1st class degree. Similarly, a better GCSE performance increases the probability of a student getting a 2.1 degree, with that probability increasing further – whatever the GCSE performance – the better the AS-level result.

Although the pattern of ratios shown in Table 2 is not as clear-cut as that in Table 1, nevertheless there are straightforward general conclusions: those with better GCSE performances tended to get better degrees; those with better AS-level performances tended to get better degrees; and those who performed better at AS-level than at GCSE, got better degrees than those who did not. So just as the dropping of the AS qualification would deny candidates who perform better there than at GCSE the chance to gain entry to the 'better' universities, it also denies the universities to which they currently apply the chance to admit students who are likely to achieve highly in their degree outcomes, as indicated by the improvement in their academic performance during the first post-compulsory schooling year. Without the AS examination grades as an entry criterion the quality of undergraduate entry to the 'better' universities will, on average, be reduced.

GCSE performance, AS-level performance, institution attended and degree performance

Given the above findings, the final question addressed here is whether degree result differs not only by GCSE and AS-level performance but also by type of institution attended: for example, are those in the third quintile for GCSE and the fifth for AS-level more likely to have obtained a 'good degree' (usually identified as either a 1st or a 2.1) if they attended one type of institution rather than another?[8] To answer that, a final analysis was undertaken combining all four variables in a five-by-five-by-five-by-four (GCSE quintile, by AS-level quintile, by type of institution, by degree class) matrix. As a class 2.1 degree was the dominant mode among the students (56 per cent), the discussion below focuses on those who got either a 1st or a 2.2 – the numbers getting a 3rd being too small for detailed evaluation.

Table 3 provides the resulting ratios for those getting a 1st class degree; the first column in the first block of five rows, for example, gives the estimated ratios for getting a 1st class degree for students in the lowest quintile at both GCSE and AS-level, at each of the five institutional types. As anticipated, students with relatively weak performances at both GCSE and AS-level were unlikely to gain a 1st; virtually all of the estimated ratios in the first three blocks and first two columns together (i.e. the top-left triangle in the table) are less than 1.0 and most are significantly smaller than 1.0 (i.e. they are shown in bold). Students in the lowest two quintiles at GCSE were unlikely to get a 1st unless

they were in the upper quintile for AS-level – and only two of those ratios were significantly greater than 1.0 (1.41 and 1.48), reflecting the small absolute numbers in those cells.

By contrast, most of the ratios in the right-hand two columns and across all five blocks of rows are significantly greater than 1; students with a good performance at either – and especially both – of GCSE and AS-level were more likely to get a 1st at any type of institution than would have been the case if GCSE and AS-level performance were not good predictors of degree outcome. But there were interesting differences between the institutional types, especially the four university groupings – the 'Other' degree-awarding bodies tend to deviate from the general trends. For example, among those candidates who were in the top quintile at GCSE and each of the AS-level quintiles (the furthest right-hand column in Table 3) the ratio for getting a 1st class degree increased as one moved down the 'university hierarchy' from the Russell Group through the other Pre-1992 and 1992 to the Post-1992 institutions. Of those in the fifth quintile for GCSE and the fourth for AS-level, for example, the ratio for Russell Group universities was 1.51 (i.e. 51 per cent more students were in that category than would be expected if there were no relationship between school examination and degree performance), increasing to 1.90 for the Pre-1992 universities, 2.98 for the 1992 universities and 2.87 for those created after 1992. Furthermore, the ratios for the 1992 and Post-1992 universities are significantly larger (when comparing the Bayesian CIs) than those for the Russell Group institutions; and in the final category – students in the top quintile at both GCSE and AS-level – the ratio for those latter institutions is significantly smaller than that for each of the other three types. The Russell Group universities, it seems, are less likely to award 1st class degrees to students who were high-fliers at the two school examinations than are universities lower down the 'university hierarchy'. (Many of the Russell Group universities have substantial numbers of students who attended independent schools, and analyses – e.g. Hoare and Johnston, 2011 – have shown that students who attended such schools on average perform less well at university than contemporaries with the same performances at A-level who attended state schools.)

For class 2.2 degrees, Table 4 displays a pattern very largely the mirror image of that in Table 3. Students with relatively weak performances at GCSE and AS-level were most likely to obtain such degrees (ratios greater than 1.0 in the top-left triangle of the table, almost all of them significantly larger than 1.0), whereas those who performed well at school were less likely than expected to get a 2.2 (ratios significantly lower than 1.0 in the table's lower-right triangle). Unlike the pattern for the award of 1st class degrees, however, there is much less evidence of significant differentials between the institutional types, especially with regard to the top-performing student groups at the school examinations. Thus, for example, although there is some evidence of fewer 2.2s being awarded by the Post-1992 institutions than by the Russell Group and Pre-1992 universities, there are no significant differences: statistically, students in the fourth and fifth quintiles at the two school examinations are as likely to get a 2.2 whichever type of institution they attended.

Discussion

All UK governments during the last two decades have subscribed to producing 'evidence-based policy' as part of the utilitarian turn in academic research (Solesbury, 2001). But they have also mostly been driven by what Brown (2013) refers to in his assessment of 25 years of higher education policy as the ideology of the market. He concludes that many cases of policy change in that sector have been characterised not by evidence-based policy but rather by policy-based evidence; a policy has been determined and evidence then sought to sustain it. This practice was defined by the House of Commons Science and Technology Committee (2006, 47) as either selectively picking 'pieces of evidence which support an already agreed policy' or commissioning 'research in order to publish a justification for policy'.

The decision to abolish AS-level examinations in their then form appears to fit this latter characterisation. It was announced by the then Secretary of State, Michael Gove, in January 2013 (Department for Education, 2013a), largely on the grounds that the quality of A-level courses was declining because of their modularisation and division into the AS and A2 years. This stimulated concerns from universities and the teaching profession that abolition of AS-levels would harm the university admissions process (as reported, for example, on Huffington Post, 2014), and so in May of that year research results were published that apparently sustained the political decision (Department for Education, 2013c) – a clear case of policy-based evidence that, in the House of Commons Select Committee words, involved 'commissioning research in order to publish a justification for policy'? (According to a Minister in the Department for Education – Laws, 2013 – this research showed that 'Knowing AS levels as well as GCSEs does *not* [his emphasis] add significantly to an admission officer's ability to predict outcomes'.) Because of difficulties in obtaining the data to assess that research, its quality could not be evaluated for a year (an initial evaluation was published in two widely-read blogs in July 2014: Johnston et al., 2014a, 2014b), making the results of little use to those challenging the policy; school syllabuses and curricula were already being remodelled. The opposition Labour party did state that it would reverse the change (Burns, 2013) – but that commitment was not repeated in its 2015 general election manifesto (Labour Party, 2015).

Students sat the last AS-level examinations as the first stage of the A-level qualification in May-June 2015. Three months later, university admissions officers bemoaned their future absence, one from a Russell Group institution claiming that 'The AS is a piece of concrete information about how the candidate is performing, so when you're making the decision you have a fairly good idea of how they're doing. The removal of the AS will make things harder for tutors' (Ratcliffe, 2015). Particular difficulties, it was argued, would arise in assessing the potential of applicants from relatively disadvantaged home, neighbourhood and school backgrounds, which could impede the government's pressure on universities to widen participation from such groups.

Universities were still deciding in late 2015 how they would make future admission offer decisions for the academic year 2017-2018 onwards in the absence of AS-level results – in the context of research reported in the *Times Education Supplement* (TES, 2015) by Cambridge Assessment (2015) that half of teachers' predicted A-level grades are wrong; many of those assessments will have been based at least in part on students' AS-level performance. (In the future teachers will undoubtedly use whatever internal examinations schools introduce at the end of the first year of the A-level course to evaluate student progression, but these data will lack the external validation and comparability associated with the AS-level examinations.) Thus a policy change with extensive and important implications for many stakeholders was made and implemented on the basis of policy-based research evidence published (and probably conducted) after the change was announced, and delayed provision of access to the data meant that its quality could not be assessed for more than a year – much too late to influence a decision made on ideological grounds.

In summary

These analyses, using a robust statistical technique for analysing differences within large contingency tables, have provided strong evidence that British student performance at both of the two sets of school examinations traditionally taken into account by universities when considering applications for degree programme places was strongly related to their performance on those courses (in the data set used by government statisticians relating to students who graduated in 2011). This justifies the universities' practice of using applicants' school grades when assessing their suitability for their courses. The 'better', more prestigious, institutions get the 'better' students, who get the 'better' degrees.

The crucial element of those findings, given recent policy changes, is that although the two sets of school examinations were taken only one year apart nevertheless there is not a strong correlation between them in student performance. Many perform better at the second set of examinations (the more specialised AS-levels) than at the first, and universities have recognised this in their decisions on which students to offer places to. From 2016 on, however, comparable quantitative information on student trajectories during their two years of post-compulsory secondary education will not be available because the AS-level examinations have been abolished in the form that would be useful to university admissions officers.[9] They will not have quantitative advice on which students are improving during that period and who might be better able to benefit from a university degree course – especially in the country's most prestigious higher education institutions – than those whose performance is either unchanged or declines. As a result – unless and until the universities can devise alternative procedures to replace the lost information on student progress during their two years studying towards an A-level qualification, such as reinstating in some cases their own entrance examinations – it may well be that a substantial number of students well-fitted to benefit from a degree course at a research-intensive university may not be identifiable, and places will be taken up by those less able to benefit. (As an aside, the analyses did show that the most able students would probably not be disadvantaged in the class of their degree if their full potential were not recognised; degree results did not differ that substantially between types of institution once school performance was taken into account. Nevertheless, a degree from a Russell Group university arguably carries more cachet than a comparable one from the other types of institution, which can be important in graduates' career trajectories as some employers place a recruiting premium on getting a 'good degree' from a 'good university'. With the abolition of AS-levels, therefore, some 'late developers' could not only be denied the chance of attending an elite university but also have their career prospects limited.)

Gaining entrance to the university and degree courses of their choice is a difficult and demanding process for students, and selecting students for courses is a skilled task undertaken by university admissions officers. Recognising potential is difficult and, ultimately, subjective but it is considerably aided by good quality objective data. The analyses reported here indicate that the UK government has decided to deny British universities one such type of that data and English students the opportunity to demonstrate their developing potential. A difficult and fraught transition from school to university could become more so for both of them. That decision was not evidence-based, as the research claimed to support the policy change was not published until after it was made; the flawed nature of that evidence was not made apparent for more than a year – too late to influence the policy change – because of delays in releasing the relevant data under the Freedom of Information Act. Most academic research is only published after it has been validated by independent assessors through the peer review process – and other such research undertaken on a contractual basis (including for government departments) is also often submitted for independent assessment before its adoption as a policy base. The case study presented here illustrates that when such quality controls are not undertaken and the data are not readily available for re-analysis, a policy that appears to be evidence-based may not be, with consequences that are potentially long-lasting until another government minister – influenced by reputable research – decides to make another policy change.

Notes

[1] The discussion here focuses on the 'normal' route, from which there are exceptions: students take a year out at some stage in the sequence, for example, and may not apply to university until they know their A-level grades, in which case they can be made a firm rather than conditional offer of a place.
[2] The UK Department for Education controls school education in England only; it is a devolved responsibility in the other three countries.
[3] AS-levels were not abolished. They are retained as 'free-standing' one year courses but with syllabuses not designed as the first stage of an A-level course. They are not suitable for students intending to apply for university entrance, therefore, and many schools have decided not to offer them in a full range of subjects.
[4] Cambridge and Oxford universities get much lower ratios of applicants per place than the other Russell Group institutions, as schools are selective in which students they encourage to apply to those two universities with the highest scholarly reputations.
[5] Of course, some of the 'better' students may prefer to study at other types of institution, because of the attraction of a particular degree programme, for example, or because they wish to go to a university near to their home.
[6] There were too few students graduating from Cambridge and Oxford Universities in the data set for us to analyse them separately from the rest of the Russell Group.
[7] For example, the CIs for the first estimated value of 0.07 are 0.06 and 0.09, indicating that there is a 0.95 probability that the true value for the ratio lies within this range. For the second estimated value of 0.14, the CIs are 0.11 and 0.17. As these two distributions do not overlap, it is concluded that the ratio of 0.14 for those in the lowest quintile for GCSE but the second quintile for AS-level is statistically significantly larger than that of 0.07 for those in the lowest quintile for both examinations.
[8] The five types of institution vary in the frequency with which they award degrees in the different classes. As one moves from the Russell Group through to the 'Other' category the percentage of 'good degrees' (Class 1 and 2.1) declines (from 80 per cent in the Russell group through 60, 62 and 61 to 61 per cent in the 'Other' category) and that of Class 2.2 and 3 degrees increases accordingly.
[9] The Labour party claimed at the time of abolition that it would reverse the decision if it won power at the next (2015) general election, but reinstating AS-levels would not be straightforward and there would be a period of some years before the status quo ante could be restored.

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Table 1. The estimated ratios for gaining admission to the five types of degree-awarding institutions, by GCSE and AS-level examination performance (quintiles): ratios significantly different from 1.0 are shown in bold, with those above 1.0 underlined and those below 1.0 in italics.

Exam Performance (Quintiles)		Institutional Type				
GCSE	AS	Russell	Pre-1992	1992	Post-1992	Other
1	1	***0.07***	***0.67***	**2.16**	**2.24**	**1.99**
	2	***0.14***	0.87	**2.03**	**2.17**	**1.64**
	3	***0.27***	**1.21**	**1.86**	**1.72**	**1.52**
	4	***0.54***	**1.45**	**1.50**	**1.50**	**1.66**
	5	1.11	**1.55**	1.22	0.62	1.03
2	1	***0.20***	0.88	**2.00**	**1.97**	**1.90**
	2	***0.29***	1.11	**1.83**	**1.86**	**1.73**
	3	***0.50***	**1.52**	**1.55**	**1.45**	**1.36**
	4	0.92	**1.61**	**1.21**	**1.22**	0.91
	5	**1.42**	**1.72**	***0.81***	***0.70***	1.17
3	1	***0.39***	**1.19**	**1.71**	**1.82**	**1.67**
	2	***0.61***	**1.36**	**1.51**	**1.54**	**1.47**
	3	***0.85***	**1.63**	**1.26**	**1.23**	0.95
	4	**1.35**	**1.65**	0.89	0.89	0.95
	5	**1.91**	**1.53**	***0.52***	***0.64***	0.72
4	1	***0.76***	**1.44**	**1.45**	1.07	**1.63**
	2	0.97	**1.58**	**1.19**	1.08	**1.30**
	3	**1.34**	**1.69**	**0.90**	**0.79**	1.02
	4	**1.84**	**1.57**	***0.59***	***0.60***	***0.73***
	5	**2.48**	**1.17**	***0.32***	***0.32***	***0.66***
5	1	**1.63**	1.16	0.92	0.83	0.76
	2	**1.87**	1.10	***0.73***	***0.73***	1.41
	3	**2.11**	**1.39**	***0.49***	***0.48***	***0.62***
	4	**2.87**	**1.17**	***0.33***	***0.35***	***0.48***
	5	**3.16**	***0.62***	***0.10***	***0.11***	***0.33***

Table 2. The estimated ratios for gaining a degree by its class, by GCSE and AS-level examination performance (quintiles): ratios significantly different from 1.0 are shown in bold, with those above 1.0 underlined and those below 1.0 in italics.

Exam Performance (Quintiles)		Degree Class			
GCSE	AS	1st	2.1	2.2	3rd
1	1	***0.39***	***0.77***	**1.98**	**2.81**
	2	***0.42***	***0.85***	**1.88**	**2.07**
	3	***0.52***	0.98	**1.60**	**1.74**
	4	***0.69***	1.06	**1.38**	**1.52**
	5	***0.83***	1.11	1.25	1.04
2	1	***0.57***	0.92	**1.69**	**1.91**
	2	***0.63***	1.03	**1.52**	**1.30**
	3	***0.70***	**1.11**	**1.36**	0.96
	4	***0.83***	**1.22**	1.06	1.00
	5	**1.34**	**1.18**	0.91	0.80
3	1	***0.79***	**1.07**	**1.36**	**1.31**
	2	***0.83***	**1.11**	**1.30**	0.97
	3	***0.87***	**1.21**	1.08	0.86
	4	1.08	**1.26**	0.91	0.58
	5	**1.36**	**1.29**	***0.71***	***0.61***
4	1	1.05	**1.16**	1.04	1.17
	2	**1.24**	**1.23**	0.90	***0.64***
	3	**1.16**	**1.24**	0.91	***0.78***
	4	**1.29**	**1.32**	***0.70***	***0.59***
	5	**1.63**	**1.32**	***0.55***	***0.55***
5	1	**1.82**	**1.19**	***0.70***	*0.59*
	2	**2.01**	**1.24**	***0.54***	***0.51***
	3	**1.76**	**1.26**	***0.61***	***0.56***
	4	**1.78**	**1.30**	***0.52***	***0.47***
	5	**2.52**	**1.23**	***0.35***	***0.35***

Table 3. The estimated ratios for gaining a 1st class degree, by GCSE and AS-level examination performance (quintiles) and institution type: ratios significantly different from 1.0 are shown in bold, with those above 1.0 underlined and those below 1.0 in italics.

Type	GCSE	AS	Ratio	GCSE	AS	Ratio	GCSE	AS	Ratio	GCSE	AS	Ratio	GCSE	AS	Ratio
Russell	1	1	0.82	2	1	***0.44***	3	1	***0.57***	4	1	0.67	5	1	**1.81**
Pre-1992			***0.32***			***0.45***			***0.72***			0.82			1.37
1992			***0.43***			***0.71***			0.98			**1.42**			**1.72**
Post-1992			***0.31***			***0.48***			***0.73***			0.99			1.68
Other			***0.46***			***0.56***			0.70			1.24			1.40
Russell	1	2	***0.44***	2	2	***0.48***	3	2	***0.56***	4	2	***0.77***	5	2	**1.73**
Pre-1992			***0.43***			***0.58***			0.82			0.98			**1.58**
1992			***0.48***			***0.74***			***0.85***			**1.69**			**2.28**
Post-1992			***0.39***			***0.54***			0.98			**1.59**			**2.66**
Other			***0.38***			0.67			1.43			1.36			**2.71**
Russell	1	3	***0.57***	2	3	***0.40***	3	3	***0.44***	4	3	0.64	5	3	**1.51**
Pre-1992			***0.48***			***0.66***			0.87			**1.19**			**1.88**
1992			***0.56***			0.83			1.09			**1.51**			**2.11**
Post-1992			***0.57***			***0.71***			1.19			**2.20**			**2.20**
Other			0.67			0.90			0.92			**1.63**			1.73
Russell	1	4	***0.55***	2	4	***0.57***	3	4	***0.78***	4	4	0.98	5	4	**1.51**
Pre-1992			0.70			***0.74***			0.98			**1.46**			**1.90**
1992			***0.63***			1.08			1.49			**1.81**			**2.98**
Post-1992			1.10			1.02			1.41			**1.58**			**2.87**
Other			0.68			0.66			1.38			**1.57**			**1.66**
Russell	1	5	**1.41**	2	5	1.14	3	5	1.14	4	5	**1.43**	5	5	**2.39**
Pre-1992			1.05			**1.48**			1.22			**1.82**			**3.15**
1992			1.28			1.43			**1.98**			**2.47**			**4.05**
Post-1992			0.81			1.23			1.75			**2.33**			**4.00**
Other			1.03			0.86			1.43			1.29			3.29

Table 4. The estimated ratios for gaining a class 2.2 degree, by GCSE and AS-level examination performance (quintiles) and institution type: ratios significantly different from 1.0 are shown in bold, with those above 1.0 underlined and those below 1.0 in italics.

Type	GCSE	AS	Ratio	GCSE	AS	Ratio	GCSE	AS	Ratio	GCSE	AS	Ratio	GCSE	AS	Ratio
Russell	1	1	**1.67**	2	1	**1.74**	3	1	**1.54**	4	1	**1.43**	5	1	1.15
Pre-1992			**2.03**			**1.76**			**1.57**			**1.30**			0.84
1992			**1.89**			**1.82**			**1.71**			**1.40**			1.25
Post-1992			**2.14**			**1.98**			**1.54**			**1.35**			**1.94**
Other			**2.04**			**1.94**			**1.69**			1.19			1.02
Russell	1	2	**1.65**	2	2	**1.38**	3	2	**1.40**	4	2	0.99	5	2	0.88
Pre-1992			**1.72**			**1.52**			**1.31**			1.05			1.01
1992			**1.61**			**1.48**			**1.38**			1.06			0.84
Post-1992			**1.74**			**1.54**			1.17			1.14			0.83
Other			**1.72**			**1.64**			1.23			0.96			0.88
Russell	1	3	1.23	2	3	**1.32**	3	3	**1.20**	4	3	1.03	5	3	***0.72***
Pre-1992			**1.28**			**1.38**			1.10			***0.87***			***0.73***
1992			**1.35**			**1.28**			1.00			***0.83***			***0.68***
Post-1992			**1.38**			1.16			0.94			***0.68***			0.78
Other			1.21			1.18			1.14			0.82			0.58
Russell	1	4	1.07	2	4	0.93	3	4	1.06	4	4	***0.78***	5	4	***0.56***
Pre-1992			1.15			1.01			***0.79***			***0.67***			***0.57***
1992			0.98			0.89			***0.82***			***0.60***			***0.54***
Post-1992			0.98			***0.59***			***0.61***			***0.58***			***0.45***
Other			0.80			0.86			1.23			***0.44***			***0.48***
Russell	1	5	0.79	2	5	***0.57***	3	5	***0.64***	4	5	***0.54***	5	5	***0.35***
Pre-1992			0.88			***0.55***			***0.68***			***0.55***			***0.38***
1992			0.69			***0.54***			***0.60***			***0.45***			***0.33***
Post-1992			0.58			***0.75***			0.65			***0.38***			***0.26***
Other			0.80			***0.49***			0.60			***0.52***			***0.43***